

**Missouri Fertilizer Control Board**  
**Research, Education, and Outreach Projects**  
Request for Proposals

The Missouri Fertilizer Control Board (FCB) is now accepting proposals from individuals and/or institutions interested in conducting research, education and outreach projects as outlined in Missouri Revised Statute 266.336 section 2, item 7

<http://revisor.mo.gov/main/OneSection.aspx?section=266.336&bid=33284&chl>

*(7) Pursue nutrient research, educational, and outreach programs to ensure the adoption and implementation of practices that optimize nutrient use efficiency, ensure soil fertility, and address environmental concerns with regard to fertilizer use extending the results of the fertilizer experiments that may be of practical use to the farmers and agribusinesses of this state;*

The Fertilizer Control Board encourages projects that promote the efficient and environmentally conscious use of fertilizer products in the commercial or production agricultural landscape. Specifically the FCB encourages projects that will have a direct and near-term impact on Missouri farmers and that emphasize the 4R's (Right Source, Right Rate, Right Time and Right Place; <http://www.nutrientstewardship.com/4rs/>). Under this 4R banner, the FCB seeks research, education and outreach projects that cover the major crops in Missouri, including corn, soybean, wheat, sorghum, cotton, rice, hay, pasture, ornamentals, and turf. Projects that test new technologies that enhance fertilizer use efficiency, nutrient management, water quality, and other best fertilizer management practices are encouraged. Collaborative, multi-disciplinary projects are expected. Additionally, recipients of research funds must detail a plan to disseminate results and educate stakeholders, end users, and the general public of products and technologies.

Investigators should complete the following application and budget form. Investigators must ensure that the FCB receives their proposal for review no later than 20 April 2018. Proposals (PDF format only) should be submitted to Mr. Steve Taylor [staylor@mofcb.com](mailto:staylor@mofcb.com). Principal investigators are responsible for checking with their university's grants office or other appropriate entities regarding internal protocols and deadlines. Principal investigators cannot be a part of more than two proposals. Proposals will be reviewed by the FCB Research, Education, and Outreach committee, with those selected for further review notified no later than 11 May 2018. Selected investigators may be asked to present their project to the committee and/or the entire FCB in June 2018. Funds will be made available after 1 July 2018.

Published Fertilizer Control Board policy does not allow for Facility & Administrative charges (indirect) or student tuition. (See Excel budget template). Major capital purchases or buildings should not be included. Projects may extend for up to 36 months, but projects will be reviewed annually; projects deemed unsuccessful or otherwise inferior may be discontinued at any time by the FCB. Annual and final reports submitted to the FCB will be required for all projects.

Applications should fit within character limits outlined for each section (not including budget), be formatted with 1-inch margins, 12-point type, and Garamond or Times New Roman font. Only submit a pdf version of the proposal and budget. Please use the following format for all proposals.

## Proposal Format

**Title:** *(maximum of 200 characters)*

**Project leaders/investigators:**

**Justification:** *(maximum of 1,200 characters)*

**Objective(s):** *(maximum of 750 characters)*

**Methods:** *(maximum of 3,000 characters)*

**Timeline:** *(maximum of 1,200 characters)*

**Deliverables for Farmers, the Fertilizer Industry and the Public:** *(maximum of 1,200 characters)*

**Tweet of Expected Impact:** *(maximum of 140 characters)*

**Title:** Evaluation of Micronutrient Packages for Cool-Season Grass Pastures

**Investigator(s):** Carol M. Johnson, John T. Smith, and Melissa Jones

**Justification:** Cool-season grass pastures grow on more than 12 million acres and provide forage for more than 3.5 million beef cattle in Missouri. These grasses, primarily tall fescue, are popular with beef producers because they persist on infertile, poorly drained, sloped, and/or unmanaged areas.

Traditionally, pastures have received limited fertility inputs. However, as available pasture acres contract (as a result of expanding corn and soybean acreage) the impetus to maximize forage production and utilization grows. As a result, both producers and fertilizer dealers are considering fertility programs once thought of as only applicable to row-crop agriculture. New to the market are several products that claim to improve forage yield and/or utilization by animals. Offered by several well-established fertilizer suppliers, producers and fertilizer dealers are curious about the effectiveness of these products on pastures. At present, there is little independent research data examining the use of these products on cool-season grass pastures.

**Objective(s):** Develop research-based recommendations for industry personnel and farmers regarding fertilization with commercially available secondary and/or micro-nutrient packages in cool-season grass pastures. Specific objectives are:

*Objective 1:* Determine if adding a commercially-available secondary or micro-nutrient product to an existing fertilizer program improves the growth response of cool-season grass pastures.

*Objective 2:* Determine if these products change forage palatability or utilization by livestock.

**Methods:** This experiment tests the following 12 unique fertilizer products on cool-season grass pastures.

Product	Supplier	Analysis/Active Ingredients
MicroEssentials SZ	Mosaic	12-40-0-10S-1Zn
MicroEssentials S15	Mosaic	13-33-0-15S
CropPlex BLACK	United Suppliers	6-20-0-0.7Zn + Humic acid
Tracite Complex	Helena	Cu and Zn (4-4)
Bio-Forge	Stoller	N,N'-diformyl urea and K-hydroxide
Humic 20	United Suppliers	Humic acid
Black Label Zn	Loveland	6-20-0-0.7Zn
LoKomotive	Loveland	2-0-25 (K-acetate)
PMax	Rosens	Copoly-[(3-carboxypropionamide)(2-carboxymethyl)acetamide]
Lignin Magnesium	AgXplore	S-Mg-Mn (6-4-7)
Lignin Manganese	AgXplore	S and Mn (4-5)
MicroScience	AgXplore	B-Mn-Mo-Zn (0.5-3-0.001-1)
Control	-	-

Each product will be tested under both a low and a high yield scenario. In the low yield scenario, 50 lbs/acre of N will be applied in spring as a basic fertility treatment with the products listed above applied at the manufacturers recommended rate. For the high yield scenario, N-P-K will be applied according to soil testing information with a yield goal of 5 tons per acre. After fertilizer application in spring (March) the products listed above will be applied at the manufacturers recommended rate. Check treatments where no fertilizer is applied will be included. In total there will be 27 treatment

combinations tested [12 fertilizer products x 2 yield scenarios = 24 treatment plus 3 controls (low yield, high yield, and no fertilizer)].

*Cultural practices:* This study occurs on established tall fescue pastures at the Southwest Missouri Research Center near Mt. Vernon, MO. Basic fertility for the high and low yield scenarios will be applied in mid-March. Timing and rate of treatment fertility packages will be in accordance with the manufacturer recommendations.

*Design:* Treatments in both experiments will be replicated four times in a randomized complete block design. Individual plots will be 10 ft. x 35 ft.

*Measurements: Forage yield and growth rates.* Pasture yield will be measured weekly using an ultra-sonic feed reader and growth rates computed using week-over-week comparisons. Readings will begin in mid-April and end after two grazing cycles (see below). The ultra-sonic reader will be calibrated by mechanically harvesting forage from dedicated yield strips.

*Animal palatability and utilization.* In order to best test the products for pasture use, we propose to test under grazing conditions. Once the pasture reaches the ideal height for grazing (7 to 10 inches), livestock will be introduced at a temporal stocking rate of 50 to 60 hd/acre. At this stocking rate, forage should be grazed to a 2-3 inch stubble within 24 hours. To assess palatability of the forage, a representative set of livestock will be fitted with GPS collars. The GPS collars track and record livestock location every second (1 Hz). Each recording or “fix” during the grazing period will be associated with an individual plot. Previous research from our lab shows that these fixes correlate well with grazing time, and thus animal preference for forage.

**Timeline:** This study will begin in spring of 2019 and end in December of 2021 (three years of study). The table below gives a brief summary of the project's activities. (\* indicates task to be done on an annual basis throughout the three-year study)

Locate and layout plot areas; take initial soil samples	*2/15/2019
Apply high and low NPK base treatments	*3/15/2019
Apply micronutrient treatments	*4/15/2019
Measure grass height in plots with ultrasonic sensor	*Weekly all year long
Calibrate ultrasonic sensor to mechanical harvest	*April, May, June, August, October
Harvest plots with grazing cattle; determine forage mass and accumulation	*Variable based on plant growth (expect 3 to 5 harvests per year)
Prepare report to FCB	*December
Incorporate results into soil testing reports, hay school materials and forage conferences. Work with press on articles.	October 2019 through December 2021
Submit manuscript to a peer-reviewed journal	July 2022

**Deliverables for Farmers, the Fertilizer Industry and the Public:**

Farmers will learn which of these commercial micronutrient products, if any, provide return on their investment. As well, industry personnel will be informed about products they sell and can use that information in marketing. Finally, this project will demonstrate to the general public both modern farming practices as well as environmental stewardship.

The P.I.'s intend to transfer the findings in three way. First, we will incorporate the findings and recommendations from this study into the curriculum of the Missouri Grazing Schools and the annual Forage Conferences held across the state. Notably, the budget for this project includes funds for curricula development as well as travel funds to present findings at several venues. Second, we will work with the Soil Fertility Working Group and the MU Soil Testing Lab to refine the recommendations printed on soil testing results. Finally, we will prepare articles to be published in statewide and national magazines such as Missouri Ruralist, Graze, Stockman Grass Farmer and scientific (peer-reviewed) journals.

**Tweet of Expected Impact:** @MoFertBoard research shows micro-nutrients essential for high-yielding pastures @MUExtension @cafnr